CEREAL RUST BULLETIN

Report No: 1
April 15, 1986

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST PAUL 55108

Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

The winter wheat crop throughout the southern United States is in good shape except for areas in Texas where lack of moisture is becoming a problem. In most of the South the crop is 7-10 days ahead of normal development. Recent scattered rains have improved moisture in the southern Great Plains. Winterkill was minimal in Kansas and Nebraska but farther east, in Missouri and southern Illinois, winterkill of the wheat crop was significant. A recent freeze has caused some losses in Arkansas. In Kansas and Nebraska the spring seeding of oats and barley is making good progress. In the northern U.S. spring planting has started in a few areas.

Wheat stem rust -- In 1986 wheat stem rust overwintering sites were found in McNair 701 disease detection plots at Crowley, Louisiana, and Beeville and Victoria, Texas, during the first week in April. The initial infections occurred during late fall; rust increased during the mild winter, and by early April the plants were dead. In Texas, moisture has been the main limiting factor for stem rust increase except in a 75-mile-wide band along the Gulf Coast. In some fields of soft red winter cultivars in this area, rust was significant and losses will occur. For example, near Houston, Texas, stem rust decimated 3000 acres of a susceptible cultivar. In central and south Texas plots and fields, stem rust was found on susceptible cultivars (Mit, Coker lines, etc.). In general, the infections on Mit were of the moderately susceptible type of pustule.

Wheat leaf rust -- During early April in south Texas leaf rust was severe on cultivars ProBrand 812 and TAM 105, as occurred in 1985, but the lack of moisture limited further development. During March and early April, rainfall was minimal in central and south Texas. Rust losses in 1986 in much of Texas should be less than in 1985 because of limited moisture, more acreage of moderately resistant cultivars (e.g. Mit) planted, and fungicide spraying. Leaf rust is increasing in Oklahoma and south central Kansas.

Wheat leaf rust in the Southeast is heavy in commercial fields where planting was early enough to allow fall infection. Overwintering was widespread with reports of severities of 50-60% at tillering stage from South Carolina (Newton), Georgia, Florida, Mississippi, and Louisiana (Harrison). Traces of overwintering leaf rust infections have been reported in Ohio (Heinlein).

The leaf rust virulence combinations identified from a limited number of collections made in the period from November to February in Texas and Oklahoma are similar to last year. From 10 Texas collections the following identifications were made: UN 5 - [virulence phenotype (p)], p 1,3,10; p 1,3,10,16, p 1,3,10,24; UN 13 - p 1,2a,2c,3,10, p 1,2a,2c,3,10,16; and UN 17 - p 2a,2c,3,10. An Oklahoma collection was UN 5 - p 1,3,10. Two collections made in New York in late October were identified as: UN 2 - p 3,11 and UN 6 - p 1,2c,3,10,3ka. Two Georgia collections made in early December, were identified as UN 2 - p 3,11 and UN 6 - p 1,2c,3,9,3ka. These are similar to the virulences found in 1985 in these two states.

A number of collections were made from the cultivar Siouxland and these collections have been inoculated for increase in the greenhouse. In 1985 Siouxland, which has Lr 24 and 26, was planted on considerable acreage from central Texas to Nebraska. In 1985, only limited virulence to Lr 26 was identified and none was found for the Lr 24 and 26 combination.

Wheat stripe rust -- Severe stripe rust was found in the Temple nursery in central Texas. Many of the hard red winter wheat lines had severe rust but some resistance was noted. Light amounts of this rust were found in Giddings, Texas, and Crowley, Louisiana, experiment station plots.

Oat stem rust Severe oat stem rust was found in early planted fields and plots in south Texas the first week in April. Oat stem rust overwintered in one of these fields. In many grazed fields traces of rust were found in early April. Overall, less rust is present in south and central Texas than last year.

Oat crown rust -- This rust is more widespread and severe throughout Texas fields than last year at the same time. A few of the cultivars in plots were severely rusted because of early crown rust infections.

Barley rust -- Leaf rust was severe in plots at Beeville and Giddings, Texas, experiment stations. However, there are few commercial fields in south Texas to provide inoculum for areas to the north. No barley stem rust has been reported yet.

Rye rust -- Light amounts of leaf rust were observed on flag leaves on limited plantings in south and central Texas. No rye stem rust has been reported yet.

NOTE TO CRB RECIPIENTS:

Plans are being developed to distribute future issues of the 1986 Cereal Rust Bulletin electronically through Telemail. If you have a Telemail Box and are interested in receiving this distribution, please let us know your Telemail user name so that we can develop a Telemail distribution list for the Cereal Rust Bulletin. This process will make this information available 'on line' for anyone who has a Telemail account. If you have this capability we would encourage you to access the Cereal Rust Bulletin in this manner. This will permit access to the bulletin in a more timely manner than is possible by mail.

To let us know, please reach us either by mail, by telephone (612-373-1300), or Telemail (Mailbox = RL.CER.RUST).

We are also exploring the possibility of having the Cereal Rust Bulletin available in the Wheat Technology Newsletter and on the Agridata network.

CEREAL RUST BULLETIN

Report No: 2
May 6, 1986

From
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST PAUL 55108

Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

The wheat crop is 2 weeks earlier than normal crop development throughout Texas and Oklahoma following a warm winter and with drier than average conditions. Recent rains have slowed crop maturity in some parts of this area. In the northern Great Plains spring sowing has been delayed by wet, and in some areas, cool weather.

Wheat stem rust--Throughout central and north Texas wheat stem rust infections are widespread in both nurseries and fields in trace amounts. Since the rust arrived late in the crop season (20-40 days ago), only light losses are expected. However, the rust developing in the southern Plains could be a source of inoculum for more northern areas. Most of the spring cultivars are currently resistant. Nevertheless, with an increase in rust population size there will be more opportunity for mutations to virulence. If a mutation for virulence to Sr 6 occurs and survives in 15-TNM, the most common race, it is believed that several of the spring wheats would be vulnerable to stem rust infection and losses.

During the past two weeks severe stem rust (80% severities at early dough) was found on many of the soft red wheats growing in a nursery at Fairhope, Alabama. At the same location overwintering centers were located. In these plots rainfall was not a limiting factor for stem rust increase since they were within 50 miles of the Gulf Coast where dew formation is common. Stem rust in less severe amounts, was found in plots at Jay, Florida (Barnett); Jeanerette, Louisiana; and Plains, Georgia. Stem rust was more severe in earlier plantings than later ones along the southeastern Gulf Coast. This indicates the effect of inoculum arriving early and then overwintering with limited interfield spread during the winter and early spring.

Isolates from the first two Texas wheat stem rust collections were identified as race 15-TNM which were virulent to Sr 17.

Wheat leaf rust--In those central and north Texas locations where leaf rust overwintered, the disease is severe and losses will occur. For example, in adjacent fields of ProBrand 812 leaf rust severities were 100% in an early planted field at early dough and 5% in a later planting at early milk. Rust inoculum interchange between fields was minimal until about two weeks ago. Leaf rust losses in 1986 in Texas should be much less than in 1985.

Leaf rust was light on cultivars containing Lr 24 (Payne) and absent on cultivars with Lr 9 (Coker 762) in central and north Texas. Rust was observed only on scattered (off type?) plants of Siouxland (Lr 24 & 26). A 5% severity was observed in a single plot labeled Arkan. Otherwise cultivars are responding as expected. However, TAM W-101 may be less severely rusted than in the recent past.

Leaf rust was found on Aegilops cylindrica (goatgrass) in central and north Texas. Aegilops sp. was severely rusted in many instances when no rust was found in nearby wheat fields.

Kansas wheat leaf rust continues to develop at a fairly slow rate. Recent warm dry weather conditions are a factor in the current slow development of the disease. Rainfall over parts of the state this past week may accelerate disease development.

In the past two weeks in the southeast U.S. severe leaf rust has developed in areas where wheat was planted early enough for fall infections and moisture was sufficient for further rust development. However, if it does not rain soon in Georgia and the Carolinas, it will be difficult to find any diseases at all on the drought-damaged wheat. In many fields in eastern Arkansas leaf rust is easily

visible on flag leaves (Kirksey). Traces of overwintering leaf rust infections have been reported in southern Illinois on the cultivar Caldwell (Jacobson). In an eastern Virginia nursery leaf rust overwintered on rust susceptible, mildew resistant entries (Roane). In central Pennsylvania traces of leaf rust were found on lower leaves (Bingaman).

The leaf rust virulence combinations identified from a limited number of Texas and Oklahoma collections made in February and March were the same as reported in Bulletin #1. From Louisiana the following identifications were made: UN 13 - p 1,2a,2c,3,9,11,18; UN 2 - p 3,10; and in Mississippi: UN 2 - p 3.

Wheat stripe rust--No new reports of wheat stripe rust since the last bulletin.

Oat stem rust--During the last two weeks traces of oat stem rust were found scattered in central Texas fields. If the drought-like conditions in Texas continue rust development will be limited and inoculum for the northern oat growing areas will be light.

From ten collections made in south Texas in late March three North America (NA) races were identified: NA 5, 16, and 27, which comprised 20%, 10%, and 70%, respectively, of the isolates.

Oat crown rust--Crown rust is widespread from eastern Alabama to northern Texas. In some commercial fields in the Dallas, Texas, area severity readings were as high as 40% at milk stage.

The first pycnial infections of the season were observed in the St. Paul, Minnesota, buckthorn (alternate host of oat crown rust) nursery on May 1.

Barley rust--A significant amount of barley leaf rust overwintered in an eastern Virginia nursery. Lower leaf readings of susceptible cultivars were as high as 30% on April 23 (Roane). Dry conditions may retard further rust increase.

In nursery plots in central California (Jackson) and north central Texas (Marshall), severe barley leaf rust was found on susceptible cultivars at the soft dough stage in mid April. No barley stem rust has been reported yet.

Rye rust--Severe leaf rust (60% flag leaf readings) was observed in southwest Arkansas (Kirkpatrick) and east central Georgia in the past two weeks. No rye stem rust has been reported.

SPECIAL NOTE

Stem Rust Response of Southern and Eastern Wheat Cultivars--In the winter wheat rust nurseries at St. Paul, the Uniform Southern Soft Red Winter Wheat Nursery, the Eastern Soft Red, and the Eastern Soft White nurseries, as well as about 150 experimental lines from five southern breeding programs were planted last fall. As the season develops we will make plans for a field day or short workshop, probably during the week of July 7 through 11, to view differences in levels of stem and leaf rust resistance in these lines. If you are interested, please contact us at the Cereal Rust Laboratory or call (612) 625-6299.

CEREAL RUST BULLETIN

Report No: 3
May 28, 1986

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST PAUL 55108

Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

Wheat harvest has begun in south and central Oklahoma where the crop is ahead of normal maturity. Crop maturity also is early throughout the lower two tiers of Kansas counties. Northward through the winter wheat area maturity is more nearly normal. The small grain crop throughout much of the southeastern U.S. is in poor condition because of drought, and a significant amount of the acreage will not be harvested. In some of the northern spring grain growing region, i.e., the Red Valley of the North, seeding has been slow and well behind normal but did increase recently after a few good drying days.

Wheat stem rust -- During the past week wheat stem rust was found scattered from southern Oklahoma to southeastern Nebraska. This is the greatest incidence of stem rust observed since 1965 in this area. Trace severity was observed in commercial wheat fields and 30% severities were found on susceptible cultivars in nursery plots in southern Oklahoma. In Kansas and Oklahoma cultivars ranged from very susceptible to resistant. Arkan and Siouxland are the most resistant cultivars throughout the area. Most of the commonly grown cultivars are susceptible. In the southern two tiers of Kansas counties, at least two ages of infections were found. In the rest of Kansas stem rust was found on the flag leaves except for the northern tier of counties where rust pustules were also found on the flag -1 leaf. A susceptible cultivar at Lincoln, Nebraska, at the heading stage had a 5% incidence with 1-5 pustules per leaf. In east central and northwest Arkansas, traces of stem rust were found on susceptible cultivars in nurseries. These infections were due to spores from the south which were rain deposited. In the lower Mississippi valley there is less stem rust development than last year on the same date.

In the past two weeks stem rust overwintering centers were found in Raymond, Mississippi, and Alexandria and St. Joseph, Louisiana, nursery plots of Coker 916. Stem rust may also have overwintered in southern Oklahoma or initial infections occurred in March.

Table 1. Preliminary data of 1986 wheat stem rust race survey.

State	Collections	Isolates	Race	
			15 TNM*	56 MBC
TX	29	73	71	2
LA	4	10	10	

* All isolates virulent to Sr17.

Wheat leaf rust -- Traces of wheat leaf rust have been found as far north as southeast North Dakota (Statler), and rust overwintered in southeast Minnesota and western New York (Bergstrom) winter wheat plots.

In northern Oklahoma leaf rust was moderate and in the southern two tiers of Kansas it was heavy. Severities of 100% are common in commercial fields at hard dough stage. A 5-10% loss is expected in this area, whereas in the rest of Kansas losses are expected to be moderate to light (0-5%). In the western third of Kansas leaf rust is light because of the dry spring. In the Kansas county demonstration plots leaf rust differential responses were observed, Siouxland and Victory were resistant at all locations visited, while Arkan and Newton were variable in response.

In the past two weeks leaf rust was found throughout the southern soft red winter wheat area but because of the drought conditions in much of the area leaf rust losses will be much less than last year. As in previous years, leaf rust was severe on cultivars like Tyler but light on Florida 301.

In the Pacific Northwest leaf rust is light and developing at a slow rate (Line).

Table 2. Preliminary data of the 1986 wheat leaf rust virulence survey (5/28/86).

		Number of isolates per state								
Race	Virulence[1]	AR	FL	GA	LA	MS	NY[2]	OK	TX	Total
UN2	Lr3,10								2	2
	3,11			3	1	1	2		10	17
UN5	Lr1,3,10				1			5	12	18
	1,3,10,11		4							4
	1,3,10,16				1			6	52	59
	1,3,10,24	6							31	37
UN6	Lr1,2c,3,10,30						2			2
	1,2c,3,3ka,9,18,30			1	2				1	4
UN13	Lr1,2a,2c,3								4	4
	1,2a,2c,3,10							1	9	10
	1,2a,2c,3,11								1	1
	1,2a,2c,3,10,16								4	4
	1,2a,2c,3,10,24								1	1
UN14	Lr1,2c,10						2			2
	1,2c,10,11,18					2	6			8
UN17	Lr2a,2c,3,10				3			1	17	21
	2a,2c,3,10,24								2	2
Total		6	4	4	8	3	12	13	146	196

1 The Lr single gene differentials tested in leaf rust race identification were 1, 2a, 2c, 3, 3ka, 9, 10, 11, 16, 17, 18, 24, 30, and the cultivar Kavkaz (Lr26+).
2 Identifications from collections made in fall of 1985.

The leaf rust races identified (Table 2) are varied and include many of the historical UN race combinations (Plant Disease 70:395-397). The significant difference between the 1986 identifications so far and last year is the increase in Lr24 virulence. However, with acreage of Siouxland and Arkan this year, each possessing Lr 24, we have been particularly observing these cultivars. Collections made from them are consistently virulent to Lr 24. Also, the UN 5 (p 1,3,10,16 virulence combination) is replacing UN 17 (p 2a,2c,3,10) as the leading phenotype.

Wheat stripe rust -- Traces of stripe rust were found in several areas of south-central Kansas for the first time in 1986.

A significant amount of stripe rust was found in north central Oregon on the cultivar Faro and in the Skagit Valley of Washington. Rust development is proceeding at a slow rate in this area (Line).

Oat stem rust -- In Davis, California, oat stem rust is severe in irrigated field plots (Zwer). From the 25 collections made in south Texas in March and April three North America (NA) races were identified: NA 5, 16, 27, which comprised 8%, 4% and 88% of the isolates, respectively.

Oat crown rust -- The aecial stage of crown rust is developing on buckthorns in Dane Co., Wisconsin, and Dakota Co., Minnesota. Crown rust was light on oats in northern Oklahoma and Kansas.

Barley stem rust -- The first report of barley stem rust in 1986 was in a nursery in Dickinson Co., Kansas, on the cultivar Kanby.

Barley leaf rust -- Traces of barley leaf rust overwintered in a nursery in western New York (Bergstrom). In southeast Pennsylvania traces of leaf rust were found in commercial fields (Roof).

Rye rusts -- Rye leaf rust is present throughout Oklahoma and southern Kansas. No rye stem rust has been reported.

Barberry rust -- In Dane Co., Wisconsin, the aecial stage of stem rust was found on the common barberry in mid-May. The bushes were lightly infected but will provide inoculum to infect small grains, the alternate host for stem rust.

Other rusts -- Throughout Oklahoma and southern Kansas traces of stem rust were found on goatgrass (*Aegilops cylindrica*) and little wild barley *Hordeum pusillium*. In the same areas moderate amounts of leaf rust were found on these two wild grass species.

Special Notes:

We continue our interest in distributing the Cereal Rust Bulletin electronically through Telemail. If you have a Telemail Box and desire this access, please let us know either by mail, telephone (612/625-6299), or Telemail (Mailbox = RL.CER.RUST).

We also are continuing our plans for observation of a stem rust field test of southern and eastern cultivars and experimental lines at St. Paul. We are now suggesting this during the week of July 14-18. Let us know if you would like to visit this test plot or receive information on the results.

CEREAL RUST BULLETIN

Report No: 4
June 18, 1986

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST. PAUL 55108

Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

The wheat harvest started in northern Kansas last week. In northern Oklahoma and western Kansas, yields and test weights are low because of extreme dry conditions that occurred in the early spring. In the northern Great Plains, much of the winter wheats are near normal maturity while the spring grains are at least 1-2 weeks behind normal.

Wheat stem rust -- During the past week severe stem rust was present in winter wheat fields from southern Illinois (Jacobsen) to northcentral Kansas. Trace amounts were found in commercial fields in central Indiana (Shaner) at milk stage. In southeastern Minnesota, small foci of stem rust were found in nearly every winter wheat field (Laudon). In northcentral Kansas fields, stem rust reached 30% severity at late berry. Three weeks ago, moderate stem rust was reported in Arkansas, and currently stem rust is severe as far north as Highway I-70 in Illinois. It is likely stem rust will develop in moderate amounts across northern Indiana and through Michigan into Ontario, Canada. Resistance in these areas is probably inadequate in most commercial cultivars.

Severities ranged from 60% in susceptible cultivars in northcentral Kansas, 40% in southcentral Nebraska to traces in central South Dakota and eastcentral North Dakota (Miller) winter wheat varietal plots. The stem rust pustules found through the Dakotas were the same age and probably developed from spores deposited from the same rain shower. This is the most widespread development of wheat stem rust that has been recorded in mid-June in the past 20 years.

In 1986 the first reported date of stem rust at selected locations in the northern great plains is 10 days earlier than normal (Table 1). At these locations, this is the earliest stem rust observed in the last 21 years. In addition to these early dates for first stem rust observation, the spring wheat crop is 7-14 days behind normal crop development.

With the large amount of stem rust in the winter wheats, there will be tremendous amounts of inoculum to threaten the spring wheats. Most of the spring wheat cultivars are resistant to the rust cultures identified so far this year (Table 2), so rust severities should remain light.

Table 1. Dates of first wheat stem reported at selected locations.

	Mean date (1921-64)	1986
Southeast Nebraska	June 5	May 26
East Central South Dakota	June 16	June 10
Southeast Minnesota	June 19	June 9
Southeast North Dakota	June 24	June 13

Table 2. Preliminary data of 1986 wheat stem rust race survey (June 13).

State	Number of Collections	Number of Isolates	Race 11 RHR	Race 11 RCR	Race 15 TNM*	Race 29 HJC	Race 56 MBC
AL	6	14	1		13		
FL	1	3				3	
GA	1	3			3		
LA	6	16			16		
SC	1	3			3		
TX	73	209	2	2	203		2
Total	88	248	3	2	238	3	2

* All isolates virulent to Sr17.

Wheat leaf rust -- In some southeastern Nebraska and northcentral Kansas nursery plots and fields wheat leaf rust is severe, and light losses will occur. In winter wheat varietal plots in southeast South Dakota, leaf rust severities ranged from 0 (Siouxland) to 20% (Norstar). In winter wheat fields in the same area 1-2% severity was observed on flag leaves. Currently, it is anticipated that significant rust will develop on winter wheats in the area, and light losses are expected. In these fields, two ages of infections were noted. This could be due to one of two things: either 2 spore showers 3-4 weeks apart or a spore shower in the past 2 weeks plus lower leaf infections due to overwintering.

Trace amounts of wheat leaf rust were found on winter wheats across southern Manitoba into southern Saskatchewan. In the past week 10% severity was observed in one field in Manitoba.

In the spring wheat area traces of leaf rust have been observed at the tillering stage. The large amount of wheat leaf rust inoculum will place pressure on the northern spring wheats, but since most of them have adult plant resistance, losses should be light.

In the northern soft red winter wheat area, rust is severe in Indiana and Illinois. Few of the currently grown cultivars have fully adequate resistance under severe epidemic conditions.

The frequency of Lr16 virulence decreased in collections made in Oklahoma and north Texas from the frequency in central and south Texas. The frequency of combined virulence to Lr2a and 9 first found in 1985, is greater than in 1985 in collections made in the southeastern U.S. Virulence to Lr24 is more frequent in Texas than in previous years and was identified in a UN 17 phenotype for the first time.

Table 3. Preliminary data of the 1986 wheat leaf rust virulence survey (6/16/86).

Race	Virulence	Number of isolates per state									
		AL	AR	FL	GA	LA	MS	NY	OK	TX	Total
UN2	Lr3,10									2	2
	3,11	4			4	1	1	2		11	23
UN5	Lr1,3,10	2			1	2			5	16	26
	1,3,10,11			4					5		9
	1,3,10,16					3			7	70	80
	1,3,10,24		8							33	41
UN6	Lr1,2c,3,10,30							2			2
	1,2c,3,3ka,9,18,30			2	1	2				1	6
UN13	Lr1,2a,2c,3			1					2	6	9
	1,2a,2c,3,10					3			1	11	15
	1,2a,2c,3,10,24									1	1
	1,2a,2c,3,10,17	3		3	5						11
	1,2a,2c,3,9,11,18	1	1		3	4					9
UN14	Lr1,2c,10							2			2
	Lr1,2c,10,11,18						2	6			8
	Lr1,2c,10,11				3	4					7
UN17	Lr2a,2c,3,10	1				3			6	23	33
	2a,2c,3,10,24									2	2
Total		11	9	10	17	22	3	12	26	181	289

* The Lr single gene differential isolines tested in leaf rust race identification were 1, 2a, 2c, 3, 3ka, 9, 10, 11, 16, 17, 18, 24, 30, and the cultivar Kavkaz (Lr26+).
@ Identifications from collections made in fall of 1985.

Wheat stripe rust -- We are unaware of any new reports of wheat stripe rust in the United States since the last bulletin.

Oat stem rust -- During the second week in June traces of oat stem rust were found in nurseries and fields in northcentral Kansas and southern Nebraska. It is anticipated that rust will appear in the spring oat area in the next two weeks.

Oat crown rust -- Crown rust is scattered throughout the northern oat growing area from southern Nebraska to northeast South Dakota to central Wisconsin. In central and northern Iowa, this is the most severe outbreak of crown rust since 1957 (Simons). With a return to warm, moist weather, the crown rust will spread and increase in the northern areas, and rust will be a severe problem in many locations. Late planted fields (May-seeded) could become severely rusted.

Barley stem rust -- Traces of barley stem rust were found in nursery plots at the Colby, Kansas, and Waseca, Minnesota, experiment stations. The T-gene resistance should be adequate to prevent severe losses. It is anticipated that late (May-seeded) barley will be rusted by maturity. Most of the inoculum will be from winter wheat fields adjacent to barley fields.

Barley leaf rust -- Moderate amounts of barley leaf rust were found on some cultivars in nurseries in eastern Virginia (Roane) and southeast Pennsylvania (Bingaman) No leaf rust has been observed on barley in the central and northern Great Plains.

Rye rusts -- Rye leaf rust has been found on winter rye in southcentral Minnesota, eastern South Dakota, and southern West Virginia (Williams). No rye stem rust has been reported.

Barberry rust During the first week in June, aecial collections were made in 15 different locations in southeast Minnesota (Laudon, Schlick, Sreenivasam). Aecial collections also were made in southern West Virginia (Bostic) and eastern Canada (Clark).

Other rusts Stem rust was found on timothy growing in a minimum tillage field of winter wheat in south central Minnesota.

SPECIAL NOTE

Stem Rust Response of Southern and Eastern Wheat Cultivars -- The Uniform Southern Soft Red Winter Wheat Nursery, the Eastern Soft Red, and the Eastern Soft White nurseries, as well as about 150 experimental lines from five southern breeding programs were planted in the winter wheat rust nurseries at St. Paul last fall. We are planning a mini-field day on July 15, 1986 to review the resistance available in these materials. If you are interested in participating please write to us at the Cereal Rust Laboratory or call.

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CEREAL RUST BULLETIN

Report No.: 5
July 17, 1986

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST. PAUL 55108

Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

The winter wheat harvest has progressed into a few early planted fields in North Dakota, southern Minnesota and Wisconsin. The long days have resulted in much of the spring wheat reaching near normal crop development stage, although with a reduced yield potential. However, there still are some areas (Cavalier and Marshall Counties in the Red River Valley of ND and MN, respectively), where there are many fields still in the jointing stage. Spring wheat fields in close proximity to each other may range in maturity from jointing to late milk.

Wheat stem rust -- During the past week, stem rust was found in winter wheat fields and plots throughout much of the Northern Great Plains area. This is the most extensive wheat stem rust observed in this area in the past 20 years. Several suspected overwintering sites of stem rust were found in southwestern North Dakota where the rust occurred on stems within one inch of ground level. It is highly unusual for stem rust to overwinter this far north. In plots, stem rust was severe (20 to 60%) on the following winter wheat cultivars: Bighorn, Norstar, Norwin, Redwin, and Rose. While present in the other winter wheat cultivars, rust severities were light (1-2% at soft dough). Roughrider and Agassiz were adequately resistant to prevent significant rust development.

In the Northern Great Plains where stem rust was severe on winter wheats, rust also was found on spring wheats in plots. The most susceptible cultivars were Bronze Chief, Leo, and Norseman, on which severities ranged from trace to 1% at early milk. The most severe stem rust (20%) in spring wheats was found on the rust susceptible cultivar Baart in plots at Carrington, ND. Most of the spring wheat cultivars are resistant to the rust cultures identified so far this year (Table 1), so rust severities should remain light. Stem rust was common on Hordeum jubatum (wild barley), and in plots at Beach, ND it was severe on Russian wild rye. This is thought to be the wheat stem rust form, and Russian wild rye may have been an overwintering source.

Stem rust is present in winter ~~field~~ wheat fields and plots throughout Wisconsin (Line), central Indiana (Grogan), and northern Ohio (Heinlein) to central New York (Bergstrom). Stem rust was severe on susceptible cultivars with trace severities on most of the other cultivars.

Table 1. Preliminary data of 1986 wheat stem rust race survey (July 14).

State	Number of Collections	Number of Isolates	11 RHR	11 RCR	15 TNM	29 HJC	56 MBC
AL	7	14	1		13		
AR	1	3			3		
FL	4	11	2		4	5	
GA	1	3			3		
KS	6	16			16		
LA	6	16			16		
MS	2	5			5		
OK	12	24			24		
SC	1	3			3		
TX	92	249	2	2	243		2
Total	132	344	5	2	330	5	2

*All isolates viru ent to Sr17.

Wheat leaf rust -- In the past two weeks severe leaf rust developed on susceptible winter wheat plants in southwestern North Dakota, central Wisconsin, eastern Michigan (Clayton), northern Ohio (Heinlen), eastern Pennsylvania (Bingaman), and western New York (Schilder) fields. Losses are expected in the severely infected susceptible cultivars. In southwestern North Dakota where leaf rust severities of 100% are common, overwintering probably occurred in many fields in 1986.

In the spring wheat area, there is a great variation in rust severity among nearby locations. These variations in severity are probably due to one or more of the following: 1) nearness of rusted winter wheats, 2) local environmental conditions, and 3) amount of exogenous inoculum and when it arrived. The spring wheat cultivars most susceptible to leaf rust are Apex, Buckshot, Leo, and Butte. At the present time most of the commonly-grown cultivars are resistant to leaf rust. In areas where rust is severe, Marshall has severities up to 20 percent with a moderately resistant to moderately susceptible response.

From leaf rust collections made from Aegilops cylindrica in north Texas, the virulence combination (UN 9) Lr1,2a,2c,17 was identified. Although wheat leaf rust, this is different from any collections made from wheat.

Table 2. Preliminary data of the 1986 wheat leaf rust virulence survey (7/14/86).

Race	Virulence[1]	Number of isolates per state										
		AL	AR	FL	GA	KS	LA	MS	NY[2]	OK	TX	TOTAL
UN 2	Lr3,10										3	3
	3,11	10			4			1	2	2	13	32
	3,10,17	2			1						1	4
UN 5	Lr1,3,10	3		2	1	6	2	3		17	25	59
	1,3,10,11			4				2				6
	1,3,10,16					3	3			7	86	99
	1,3,10,11,16										7	7
	1,3,10,24	2	9								34	45
UN 6	Lr1,2c,3,10,30								2			2
	1,2c,3,3ka,9			2	1							3
	1,2c,3,3ka,9,18,30	8					2	1		2	1	14
UN 13	Lr1,2a,2c,3	1		1						2	6	10
	1,2a,2c,3,10				1		3			5	13	22
	1,2a,2c,3,10,17	4		6	5	2					2	19
	1,2a,2c,3,10,24										1	1
	1,2a,2c,3,9,11,18	5	2	8	2		7					24
UN 14	Lr1,2c,10								2			2
	1,2c,10,11	3		4	3							10
	1,2c,10,17		2									2
	1,2c,10,11,18	2			2			5			6	15
UN 17	Lr2a,2c,3,10	2				3	3			18	42	68
	2a,2c,3,10,24										8	8
Total		42	13	27	20	14	20	12	6	53	248	455

1 The Lr single gene differential isolines tested in leaf rust race identification were 1, 2a, 2c, 3, 3ka, 9, 10, 11, 16, 17, 18, 24, 30, and the cultivar Kavkaz (Lr26+).
2 Identifications from collections made in fall of 1985.

Wheat stripe rust -- Stripe rust is developing in the Pacific Northwest at a slow rate.

Oat stem rust -- In the past two weeks traces of oat stem rust were found in almost every oat field observed in southern Wisconsin, southern Minnesota, and eastern South Dakota. Little stem rust is occuring in northern Minnesota or North Dakota on oats. Only light losses are expected in these areas. In the past two weeks, traces of stem rust were observed on wild oats (Avena fatua).

Table 3. Preliminary data of the 1986 oat stem rust survey (7/14/86).

State	Collections	Isolates	North American Races					
			5	16	23	24	27	29
CA	5	15	14			1		
TX	64	178	6	9	4		156	3
Total	69	193	20	9	4	1	156	3

Oat crown rust Crown rust is increasing slowly on much of the oats in northern Wisconsin and eastern North Dakota. On the early planted oats throughout eastern South Dakota, central Minnesota, and southern Wisconsin losses will be significant.

Barley stem rust During the past week traces of stem rust were found on 2 and 6-rowed barley in fields and plots throughout eastern South and North Dakota, generally in fields in the vicinity of winter wheats. In Berthoud, Colorado, plots of Will barley were rusted near rusted winter wheats (Milus).

Barley leaf rust -- Moderate leaf rust (20% severity) readings were made on plants in barley fields in southern West Virginia (Bostic) and southeastern Minnesota (Laudon). No leaf rust has been reported in the principal growing areas of the Red River Valley, North Dakota, and Montana.

Rye rusts -- Traces of stem rust were found on winter rye in plots in southwestern North Dakota. Winter rye leaf rust was severe in plots in central Minnesota (60%).

Other rusts -- Stem rust was found on *Agrostis alba* in southeastern Minnesota (Laudon).

CEREAL RUST BULLETIN

From:
EREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
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The small grain harvest has progressed into all areas of the northern Great Plains. Much of the winter wheat and spring barley have been harvested as far north as the Canadian border. The oats and spring wheat harvests are gaining momentum while there are areas (i.e., Red River Valley of the North) where one field is hard dough while the next field is late milk stage. Most of the northern area grains are in good condition.

Wheat stem rust--During the 1986 season stem rust overwintering sites were found within a 50 mile band along the Gulf Coast from southern Texas to southern Alabama; other overwintering centers were found up the Mississippi Valley to the Louisiana-Arkansas border and in southern Oklahoma and southwestern North Dakota. This is the most extensive overwintering area that has been observed in the last 20 years. In some commercial fields of soft red winter wheat, rust was severe where moisture was not a limiting factor. For example, near Houston, Texas, stem rust decimated 3000 acres of a susceptible cultivar. This field provided inoculum for susceptible cultivars in more northern areas. By late May stem rust was scattered from southern Oklahoma to southeastern Nebraska. In plots in these states cultivar responses ranged from very susceptible to resistant. By mid-June rust was found from central Indiana to southeastern Minnesota. Rust was severe in southern Illinois and in north central Kansas winter wheat fields. This was the most widespread development of wheat stem rust that has been observed in the past 20 years in the southern Plains.

The first reported date of stem rust at selected locations in the northern Great Plains was 10 days earlier than normal. By mid-July there was the most extensive stem rust observed in the northern Great Plains since 1965. Throughout the northern winter wheat area stem rust was severe on susceptible cultivars, and trace severities occurred on most of the other cultivars.

With the large amount of stem rust inoculum produced on the winter wheats there was tremendous inoculum pressure for the spring wheats. However, currently the majority of the hard red spring wheat cultivars are resistant to the rust cultures identified so far this year. Stem rust losses will again be insignificant for the 1986 spring wheat.

During the last week in July stem rust was found in light amounts in fields and plots in eastern Oregon and eastern Washington. This rust has historically differed in virulence from the population of the Great Plains area.

As shown in Table 1, race 15-TNM is the most common race identified from 1986 collections and is the most common race found in each area east of the Rocky Mountains.

Table 1. Preliminary data of 1986 wheat stem rust race survey (08/04/86).

STATE	Number of Collections	Isolatea	Race (% of isolates per state) 11 RHR	15 TNM	15 TNM*	29 HJC	56 MBC	151 QCB	151 QSH
AL	7	14	7		93				
AR	14	40	5		95				
CA	5	14	14		28	36			21
GA	3	6			100				
IN	4	12			100				
KS	53	144			98	1			1
LA	8	22			100				
MN	15	9			100				
MO	2	6			100				
MS	4	9			100				
ND	1	0							
NE	15	42			95				5
OH	1	0							
OK	44	115			100				
SC	1	3			100				
SD	7	17		6	82				12
TX	95	250	1		98		1		
WV	4	0							
Total	298	703	1	**	96	1	**	**	1

* Isolates virulent to Sr 17.

** Less than 0.6.

Although stem rust was more widespread and damaging than for 20 years, there is no evidence of new races. More extentive overwintering, wide use of susceptible cultivars in the overwintering area, combined with a generally favorable season appear to account for the 1986 epidemic.

Wheat leaf rust--In summary for 1986, leaf rust overwintered extensively throughout the southern United States in many of the same locations as in 1985. By early April in south Texas, leaf rust was severe on selected cultivars (i.e., ProBrand 812, TAM 105) but the lack of moisture limited further rust development. In much of Texas, rust losses were less than in 1985 because of limited moisture, more acreage of moderately resistant cultivars (e.g., Mit), and some fungicide spraying. Throughout the southern soft red winter wheat area, leaf rust was severe on many of the cultivars but because of the drought conditions in much of the area leaf rust losses will be much less than in 1985. In much of the northern soft red winter wheat area leaf rust was severe on susceptible cultivars and losses were greater than last year. In much of California and the Pacific Northwest rust developed late and will not cause significant damage. In Oklahoma, Kansas, and Nebraska, severe leaf rust was found in many areas, and caused losses (e.g., over 5% in southern Kansas). Siouxland and Victory were resistant in Kansas varietal plots while Arkan and Newton varied in response, depending on location.

In the northern wheat growing area leaf rust overwintered on winter wheats over a greater area than normal. Rust overwintered from central New York to southwestern North Dakota. In the susceptible winter wheats rust was severe and losses were

common. The large amount of spores from winter wheat provided tremendous inoculum pressure on the northern spring wheats, but the adult plant resistance was adequate to avoid all but very light losses.

The majority of the data in Table 2 is from states where leaf rust caused some of the most severe losses in 1986. This year UN 5 replaced UN 17 as the leading race and a UN 5 phenotype virulent to Lr 16 was the leading phenotype. Most of these latter isolates were identified from collections made in Texas from ProBrand 812. Another of the UN 5 phenotypes was virulent to Lr 24 and was also more frequent in the United States than in previous years. This increase in Lr 24 virulence identified may be due to an increase in Siouxland and Arkan acreage and the number of collections from them, since each possesses Lr 24 Collections from these cultivars were virulent to Lr 24. Siouxland also possesses Lr 26 and was not observed to be fully susceptible in seedling tests. The frequency of combined virulence to Lr 2a and 9, first found in 1985, increased in frequency among collections made in the southeastern U. S.

Table 2. Preliminary data of the 1986 wheat leaf rust virulence survey (08/04/86).

		Number of isolates per state													
Race	Virulence*	TX	OK	CO KS	NE	LA	AR MO	MS AL	SC GA	FL	TN	PA NY	[illegible] SD	CA	Total
UN2	Lr3,10	3				1									4
	3,11	13	2					11				2			28
	3,11,17							2	1						3
	3,11,18								3						3
UN5	Lr1,3													2	2
	1,3,10	25	24	24	6	2	1	7	1	2			2		94
	1,3,10,11									4					4
	1,3,10,16	86	8	14	2	1	1								112
	1,3,10,24	34	2	5	2	2	11	3				1	2		62
	1,3,10,11,16	7													7
	1,3,11,18,30							2							2
UN6	Lr1,2c,3,10										1	2		1	4
	1,2c,3,3ka,9					2			3	2		1			8
	1,2c,3,10,17											1			1
	1,2c,3,3ka,18,30	1						2							3
	1,2c,3,3ka,9,18,30	1				2		6							9
UN9	Lr1,2a,2c,17	4		1											5
UN13	Lr1,2a,2c,3,10	8	2	11											21
	1,2a,2c,3	6	4					1		1					12
	1,2a,2c,3,10,16	13	1												14
	1,2a,2c,3,9,11,18						1	6	3						10
	1,2a,2c,3,10,17,18			3					5	5					13
	1,2a,2c,3,10,11,18	2			1	3		3							9
	1,2a,2c,3,9,11,18,30	6				6			4	4					20
UN14	Lr1,2c,10,17													2	2
	1,2c,10,18											2			2
	1,2c,11,18	6						3							9
	1,2c,10,11,18							7	5						12
UN17	Lr2a,2c,3,10	46	17	15	9	3	1	1					1		93
	2a,2c,3,10,24	8													8
Total		269	60	73	20	22	15	54	25	18	1	9	5	5	576

* The Lr single gene differentials tested in leaf rust race identification were 1, 2a, 2c, 3 3ka, 9, 10, 11, 16, 17, 18, 24, 30.

Wheat stripe ruat--In 1986 stripe rust waa found in the central United States in

central Texas, southcentral Kansas, northcentral Colorado and southern Louisana nurseries. This represents a large area but the rust was light at all locations. In the Pacific Northwest stripe rust developed late, and losses will be light.

Oat stem rust--In early April severe oat stem rust was found in Texas fields and plots where it had overwintered. The rust moved north but a dry period in northern Texas limited development. Stem rust was found in almost every field in the northern oat growing area (Minnesota and the Dakotas) but since the inoculum arrived in light amounts, losses were minimal except for a few late-planted fields in central Minnesota and northern Wisconsin. As in previous years oat stem rust was severe on wild oats (Aveva fatua) in eastern North Dakota and northwestern Minnesota. Note difference of the California (western) and Great Plains rust populations (Table 3).

Table 3. Preliminary data of the 1986 Oat stem rust survey (08/04/86)

State	Number of Collections	Isolates	NA Race (%) of isolates 5	10	16	23	27	29
CA	11	33	97	3				
KS	3	7					100	
NE	1	3					100	
TX	72	185	4		5	2	88	2
WV			50					
Total	88	230	17	*	4	2	75	1

Oat crown rust--In summary, in 1986 oat crown rust was more widespread and severe throughout Texas fields and plots than in the previous two years. In the northern oat growing area this was one of the earliest and most severe outbreaks of crown rust in Iowa in the past 30 years. Much of the rust developed in fields where inoculum arrived early from the south and conditions were ideal for rust development. Buckthorn hedges growing in close proximity to oat fields also provided some of the initial inoculum in Wisconsin. Severe rust developed with resultant losses in many fields from central Wisconsin to eastern South Dakota.

Barley stem rust--In 1986, barley stem rust was found in 2 and 6-rowed barley fields and plots throughout northwestern Minnesota and eastern South Dakota and North Dakota. The most severely rusted fields were adjacent to winter wheat fields. The T-gene resistance seemed to be adequate to prevent barley stem rust losses. Severe stem rust infections were found throughout the Northern Great Plains on wild barley (Hordeum jubatum).

Barley leaf rust--In 1986, leaf rust was severe on some cultivars in eastern Virginia, western New York, northcentral Texas and central California, where it overwintered. Generally in the northcentral states only light amounts of barley leaf rust were found; however, in the late maturing fields leaf rust is more severe. Losses will be light.

Rye stem rust--The only rye stem rust observed was in North Dakota and Minnesota fields and plots. Losses will be minimal in these fields.

Rye leaf rust--By early May rust was found throughout the southern U. S. where the rust generally is present through the year. By mid-June leaf rust was severe on flag leaves throughout Minnesota and South Dakota. Rye flag leaves provide less of the photosynthate for grain production than with most other cereals. Thus, for leaf rust losses to be severe lower leaves must be infected early in the season.

Barberry rust--In 1986, aecial collections were made in southeastern Minnesota,

southcentral Wisconsin, southwestern Virginia and southeastern Ontario, Canada. In Minnesota the bushes were large fruiting bushes heavily infected with rust. This indicates the bushes have been present for a number of years and have the potential to spread.

Other rust hosts--Throughout Kansas and Oklahoma stem and leaf rust were found on goat grass (Aegilops cylindrica) and little wild barley (Hordeum pusillium). Stem rust also was found on Timothy (Phleum pratense) and redtop (Agrostis alba) in southeastern Minnesota. In North Dakota stem rust was found on Russian wild rye (Elymus junceus) and slender wheat grass (Agropyron trachycaulum).